PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference WO 33191	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/IB 2002/002181	International filing date *(day/month/year)* 13.06.2002	Priority date *(day/month/year)*

International Patent Classification (IPC) or national classification and IPC H04Q 7/38, H04B 7/005

Applicant Nokia Corporation et al

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 6 sheets, as follows:

      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))

      _____ , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

   ☒ Box No. I   Basis of the report

   ☐ Box No. II   Priority

   ☒ Box No. III   Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

   ☐ Box No. IV   Lack of unity of invention

   ☒ Box No. V   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

   ☐ Box No. VI   Certain documents cited

   ☐ Box No. VII   Certain defects in the international application

   ☐ Box No. VIII   Certain observations on the international application

Date of submission of the demand 13.01.2004	Date of completion of this report 13.09.2004
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Form PCT/IPEA/409 (cover sheet) (January 2004)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/IB 2002/002181

Box No. I	Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on a translation from the original language into the following language _____ , which is the language of a translation furnished for the purposes of:

   ☐ international search (under Rules 12.3 and 23.1(b))

   ☐ publication of the international application (under Rule 12.4)

   ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

   ☐ the international application as originally filed/furnished

   ☒ the description:

       pages   __1-15__ _____ as originally filed/furnished

       pages* _____ received by this Authority on _____

       pages* _____ received by this Authority on _____

   ☒ the claims:

       pages _____ as originally filed/furnished

       pages* _____ as amended (together with any statement) under Article 19

       pages* __1-6__ _____ received by this Authority on __06.05.2004__

       pages* _____ received by this Authority on _____

   ☒ the drawings:

       pages   __1-4__ _____ as originally filed/furnished

       pages* _____ received by this Authority on _____

       pages* _____ received by this Authority on _____

   ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

   ☐ the description, pages _____

   ☐ the claims, Nos. _____

   ☐ the drawings, sheets/figs _____

   ☐ the sequence listing *(specify)*: _____

   ☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

   ☐ the description, pages _____

   ☐ the claims, Nos. _____

   ☐ the drawings, sheets/figs _____

   ☐ the sequence listing *(specify)*: _____

   ☐ any table(s) related to the sequence listing *(specify)*: _____

*   *If item 4 applies, some or all of those sheets may be marked "superseded."*

Form PCT/IPEA/409 (Box No. I) (January 2004)

| Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application

☒ claims Nos. 1-19 in part _____

because:

☐ the said international application, or the said claims Nos. _____
relate to the following subject matter which does not require an international preliminary examination *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. _____
are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. _____ are so inadequately supported
by the description that no meaningful opinion could be formed.

☒ no international search report has been established for said claims Nos. 1-19 in part _____

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form   ☐ has not been furnished

                          ☐ does not comply with the standard

the computer readable form ☐ has not been furnished

                          ☐ does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in the Annex C-*bis* of the Administrative Instructions.

☒ See Supplemental Box for further details.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box III.

The original independent claims 1, 11 and 21 provided for a large number of possible methods and systems and the international search were therefore only carried out for certain parts of these claims. After amendment of the claims (2004-05-06), said original claims 1, 11 and 21 remain as part of the new claims 1, 10 and 19. Therefore, this report is only valid for the parts of the present claims 1, 10 and 19, which were included in the international search report.

Motivation from the international search report:
"The present claims 1, 11 and 21 provide for a large number of possible methods and systems. These possibilities differ widely within the area and the description fails to support all possibilities. In fact, the claims contain so many options that a lack of clarity and conciseness within the meaning of Article 6 PCT arises to such an extent as to render a meaningful search of the claims impossible.

Consequently, the search has only been carried out for those parts of claims 1, 11 and 21, which appear to be supported and disclosed, namely a method and a system for adaptive resource allocation of a physical shared channel by adjusting power or spreading factor."

Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-19	YES
	Claims		NO
Inventive step (IS)	Claims	1-19	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-19	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Documents cited in the International Search Report:
D1: EP1209936 A
D2: WO0245291 A
D3: "Packet service in UMTS: delay-throughput performance of the downlink shared channel" (Borgonovo et al, ISSN: 1389-1286)
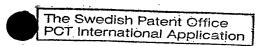D4: EP1035676 A

The cited documents represent the general state of the art.
The invention defined in claims 1-19 is not disclosed by any of these documents.
The cited prior art does not give any indication that would lead a person skilled in the art to the claimed method and system for adaptive resource allocation of a physical shared channel by adjusting power or spreading factor. Therefore, the claimed invention is not obvious to a person skilled in the art.
Accordingly, the invention defined in claims 1-19 is novel and is considered to involve an inventive step. The invention is industrially applicable.

Please note that this report is only valid for claims 1-19 in part - see box III for further information

PCT/IB2002/002181

PCT/ 10/517448

The Swedish Patent Office
PCT International Application

06 -05- 2004
DT05 Rec'd PCT/PTO 0 9 DEC 2004
Enclosure of May 6, 2004

PCT-Application No.: PCT/IB2002/002181
Applicant: Nokia Corporation
Our ref.: WO 33191

CLAIMS

1. A method for adaptive setting or reservation of channelization codes and/or power for downlink channel in a communication network, using parameters (SF_{min}, $P_{txDSCHallowed}$) for minimum allowed Spreading Factor, SF, and/or allowed power level, the parameters being set depending on the traffic load, the total cell load and/or the availability of channelization codes, wherein three kinds of measurements are performed:

1. Average transmitted power of a physical shared downlink channel, PDSCH,

2. Relative activity factor, A, of the PDSCH, and

3. Weighted code blocking rate, B,

and adaptive adjustment of root spreading factor and power is based on these three kinds of measurements.

2. The method of claim 1, wherein a criteria for adjustment of the allowed power level is:

if A is smaller than TH_{A1}, and $P_{txDSCHest}$ is smaller than ($P_{txPDSCHallowed}$ − X), then decrease the reserved power, preferably by X or a fraction thereof,

A representing an activity factor of the downlink channel, TH_{A1} a threshold parameter, $P_{txDSCHest}$ the estimated power of the downlink channel, $P_{txPDSCHallowed}$ the power allowed for the downlink channel, and X a certain set value.

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AMENDED SHEET

3. The method of claim 1, or 2, wherein a criteria for adjustment of the allowed power level is:

if A is greater than TH_{A2}, and $P_{txDSCHest}$ is greater than $(P_{txPDSCHallowed} - X)$, then increase the allowed power by X,

5   A representing an activity factor of the downlink channel, TH_{A2} a threshold parameter, $P_{txDSCHest}$ the estimated power of the downlink channel, $P_{txPDSCHallowed}$ the power allowed for the downlink channel, and X a certain set value.

10   4. The method of any one of the preceding claims, wherein a criteria for adjustment of the minimum spreading factor, SF_{min} , is:

if B is greater than TH_B, and A is greater than TH_{A2}, then decrease SF_{min} (allow higher bit rates),

15   B representing a weighted code-blocking rate, A an activity factor of the downlink channel, and TH_B and TH_{A2} threshold values.

5. The method of any one of the preceding claims, 20   wherein a criteria for adjustment of the minimum spreading factor, SF_{min} , is:

if $B = 0$ (zero), and L_{code} is greater than TH_{code}, then increase SF_{min} (maximum bit rate is decreased),

B representing a weighted code-blocking rate, L_{code} a current 25   load of a code tree, and TH_{code} a threshold parameter.

6. The method of any one of the preceding claims, wherein a method for channelization code allocation comprises a step of reserving a new root code with a given spreading 30   factor (Spreading Factor), and a subsequent step of deciding where in a code tree this reservation is to be made.

7. The method of claim 6, wherein codes for downlink

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basically are assigned in the code tree starting from a
certain limb of the code tree, and codes are assigned for
users primarily in another limb of the code tree.

5   8. The method of claim 6 or 7, wherein a default
capacity is allocated to a territory, e.g. DSCH territory to
be used by HS-DSCH and DSCH, when the total code tree load
allows this, wherein spreading factor SF is only increased if
the code tree is highly loaded.

10

9. The method of any one of the preceding claims,
wherein total cell load is measured by power.

10. A system for adaptive setting or reservation of
15   channelization codes and/or power for downlink channel in a
communication network, using parameters ($P_{txDSCHallowed}$, SF_{min})
for minimum allowed Spreading Factor, SF, and/or allowed
power level, the parameters being set depending on the
traffic load, the total cell load and/or the availability of
20   channelization codes,
wherein the system is adapted to perform three kinds
of measurements:
1. Average transmitted power of a physical shared
downlink channel, PDSCH,
25   2. Relative activity factor, A, of the PDSCH, and
3. Weighted code blocking rate, B,
and to base adaptive adjustment of root spreading factor and
power on these three kinds of measurements.

30   11. The system of claim 10, wherein a criteria for
adjustment of the allowed power level is:
if A is smaller than TH_{A1}, and $P_{txDSCHest}$ is smaller
than ($P_{txPDSCHallowed}$ − X), then decrease the reserved power,

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preferably by X or a fraction thereof,

A *representing an* activity factor of the downlink channel, TH_{A1} a threshold parameter, $P_{txDSCHest}$ the estimated power of the downlink channel, $P_{txPDSCHallowed}$ the power allowed for the

5   downlink channel, and X a certain set value.

12. The system of claim 10, wherein a criteria for adjustment of the allowed power level is:

if A is greater than TH_{A2}, and $P_{txDSCHest}$ is greater

10   than ($P_{txPDSCHallowed}$ − X), then increase the allowed power by X,

A representing an activity factor of the downlink channel, TH_{A2} a threshold parameter, $P_{txDSCHest}$ the estimated power of the downlink channel, $P_{txPDSCHallowed}$ the power allowed for the downlink channel, and X a certain set value.

15

13. The system of any one of the preceding system claims, wherein a criteria for adjustment of the minimum spreading factor, SF_{min} , is:

if B is greater than TH_B, and A is greater than

20   TH_{A2}, then decrease SF_{min} (allow higher bit rates),

B representing a weighted code-blocking rate, A an activity factor of the downlink channel, and TH_B and TH_{A2} threshold values.

25   14. The system of any one of the preceding system claims, wherein a criteria for adjustment of the minimum spreading factor, SF_{min} , is:

if B = 0 (zero), and L_{code} is greater than TH_{code}, then increase SF_{min} (maximum bit rate is decreased),

30   B representing a weighted code-blocking rate, L_{code} a current load of a code tree, and TH_{code} a threshold parameter.

15. The system of any one of the preceding system

AMENDED SHEET

claims, wherein a method for channelization code allocation comprises a step of reserving a new root code with a given spreading factor SF, and a subsequent step of deciding where in a code tree this reservation is to be made.

5

16. The system of claim 15, wherein codes for downlink basically are assigned in the code tree starting from a certain limb of the code tree, and codes are assigned for users primarily in another limb of the code tree.

10

17. The system of claim 15 or 16, wherein a default capacity is allocated to a territory, e.g. DSCH territory to be used by HS-DSCH and DSCH, when the total code tree load allows this, wherein spreading factor SF is only increased if

15   the code tree is highly loaded.

18. The system of any one of the preceding system claims, being adapted to measure the total cell load by measuring power.

20

19. A network entity, preferably to be used in a method as defined in any one of the preceding method claims, or in a system as defined in any one of the preceding system claims, for adaptive setting or reservation of channelization

25   codes and/or power for downlink channel in a communication network, in particular for downlink shared channel, DSCH, and high speed downlink shared channel, HS-DSCH, using parameters ($P_{txDSCHallowed}$, SF_{min}) for minimum allowed Spreading Factor, SF, and/or allowed power level, the parameters being set

30   depending on the traffic load, the total cell load and/or the availability of channelization codes,

wherein the entity is adapted to perform three kinds of measurements:

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1. Average transmitted power of a physical shared downlink channel, PDSCH,

2. Relative activity factor, A, of the PDSCH, and

3. Weighted code blocking rate, B,

5   and to base adaptive adjustment of root spreading factor and power on these three kinds of measurements.

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CLAIMS

1. A method for adaptive setting or reservation of
5   channelization codes and/or power for downlink channel in a
communication network, , using parameters (SF_{min}, $P_{txDSCHallowed}$)
for minimum allowed Spreading Factor, SF, and/or allowed
power level, the parameters being set depending on the
traffic load, the total cell load and/or the availability of
10 channelization codes.

2. The method of claim 1, wherein three kinds of
measurements are performed:
      1. Average transmitted power of a physical shared
15 downlink channel (PDSCH),
      2. Relative activity factor A of the PDSCH,
      3. Weighted code blocking rate B,
and adaptive adjustment of root spreading factor and power is
based on these three kinds of measurements.
20

3. The method of claim 1 or 2, wherein a criteria
for adjustment of the allowed power level is:
      if A is smaller than TH_{A1}, and $P_{txDSCHest}$ is smaller
than ($P_{txPDSCHallowed}$ - X), then decrease the reserved power,
25 preferably by X or a fraction thereof,
A representing an activity factor of the downlink channel,
TH_{A1} a threshold parameter, $P_{txDSCHest}$ the estimated power of
the downlink channel, $P_{txPDSCHallowed}$ the power allowed for the
downlink channel, and X a certain set value.
30

4. The method of claim 1, 2, or 3, wherein a
criteria for adjustment of the allowed power level is:
      if A is greater than TH_{A2}, and $P_{txDSCHest}$ is greater

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than $(P_{txPDSCHallowed} - X)$, then increase the allowed power by X, A representing an activity factor of the downlink channel, TH_{A2} a threshold parameter, $P_{txDSCHest}$ the estimated power of the downlink channel, $P_{txPDSCHallowed}$ the power allowed for the downlink channel, and X a certain set value.

5. The method of any one of the preceding claims, wherein a criteria for adjustment of the minimum spreading factor, SF_{min} , is:

if B is greater than TH_B, and A is greater than TH_{A2}, then decrease SF_{min} (allow higher bit rates),
B representing a weighted code-blocking rate, A an activity factor of the downlink channel, and TH_B and TH_{A2} threshold values.

6. The method of any one of the preceding claims, wherein a criteria for adjustment of the minimum spreading factor, SF_{min} , is:

if $B = 0$ (zero), and L_{code} is greater than TH_{code}, then increase SF_{min} (maximum bit rate is decreased),
B representing a weighted code-blocking rate, L_{code} a current load of a code tree, and TH_{code} a threshold parameter.

7. The method of any one of the preceding claims, wherein a method for channelization code allocation comprises a step of reserving a new root code with a given spreading factor (Spreading Factor), and a subsequent step of deciding where in a code tree this reservation is to be made.

8. The method of claim 7, wherein codes for downlink basically are assigned in the code tree starting from a certain limb of the code tree, and codes are assigned for users primarily in another limb of the code tree.

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9. The method of claim 7 or 8, wherein a default capacity is allocated to a territory, e.g. DSCH territory to be used by HS-DSCH and DSCH, when the total code tree load

5   allows this, wherein spreading factor SF is only increased if the code tree is highly loaded.

10. The method of any one of the preceding claims, wherein total cell load is measured by power.

10

11. A system for adaptive setting or reservation of channelization codes and/or power for downlink channel in a communication network, using parameters ($P_{txDSCHallowed}$, SF_{min}) for minimum allowed Spreading Factor, SF, and/or allowed

15   power level, the parameters being set depending on the traffic load, the total cell load and/or the availability of channelization codes.

12. The system of claim 11, being adapted to perform

20   three kinds of measurements:
       1. Average transmitted power of a physical shared downlink channel (PDSCH),
       2. Relative activity factor A of the PDSCH,
       3. Weighted code blocking rate B,

25   and to base adaptive adjustment of root spreading factor and power on these three kinds of measurements.

13. The system of claim 11 or 12, wherein a criteria for adjustment of the allowed power level is:

30   if A is smaller than TH_{A1}, and $P_{txDSCHest}$ is smaller than ($P_{txPDSCHallowed}$ - X), then decrease the reserved power, preferably by X or a fraction thereof,
A *representing an* activity factor of the downlink channel,

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TH_{A1} a threshold parameter, $P_{txDSCHest}$ the estimated power of the downlink channel, $P_{txPDSCHallowed}$ the power allowed for the downlink channel, and X a certain set value.

14. The system of claim 11 or 12, wherein a criteria for adjustment of the allowed power level is:

if A is greater than TH_{A2}, and $P_{txDSCHest}$ is greater than $(P_{txPDSCHallowed} - X)$, then increase the allowed power by X, A representing an activity factor of the downlink channel, TH_{A2} a threshold parameter, $P_{txDSCHest}$ the estimated power of the downlink channel, $P_{txPDSCHallowed}$ the power allowed for the downlink channel, and X a certain set value.

15. The system of any one of the preceding system claims, wherein a criteria for adjustment of the minimum spreading factor, SF_{min} , is:

if B is greater than TH_B, and A is greater than TH_{A2}, then decrease SF_{min} (allow higher bit rates), B representing a weighted code-blocking rate, A an activity factor of the downlink channel, and TH_B and TH_{A2} threshold values.

16. The system of any one of the preceding system claims, wherein a criteria for adjustment of the minimum spreading factor, SF_{min} , is:

if $B = 0$ (zero), and L_{code} is greater than TH_{code}, then increase SF_{min} (maximum bit rate is decreased), B representing a weighted code-blocking rate, L_{code} a current load of a code tree, and TH_{code} a threshold parameter.

17. The system of any one of the preceding system claims, wherein a method for channelization code allocation comprises a step of reserving a new root code with a given

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spreading factor SF, and a subsequent step of deciding where in a code tree this reservation is to be made.

       18. The system of claim 17, wherein codes for
5 downlink basically are assigned in the code tree starting from a certain limb of the code tree, and codes are assigned for users primarily in another limb of the code tree.

       19. The system of claim 17 or 18, wherein a default
10 capacity is allocated to a territory, e.g. DSCH territory to be used by HS-DSCH and DSCH, when the total code tree load allows this, wherein spreading factor SF is only increased if the code tree is highly loaded.

15   20. The system of any one of the preceding system claims, being adapted to measure the total cell load by measuring power.

       21. A network entity, preferably to be used in a
20 method as defined in any one of the preceding method claims, or in a system as defined in any one of the preceding system claims, for adaptive setting or reservation of channelization codes and/or power for downlink channel in a communication network, in particular for DSCH and HS-DSCH, using parameters
25 $(P_{txDSCHallowed}, SF_{min})$ for minimum allowed Spreading Factor, SF, and/or allowed power level, the parameters being set depending on the traffic load, the total cell load and/or the availability of channelization codes.